

Example: Configuring Root Protection to Enforce Root Bridge Placement in Spanning Trees on EX-series Switches

EX-series switches provide Layer 2 loop prevention through Spanning Tree Protocol (STP), Rapid Spanning Tree protocol (RSTP), and Multiple Spanning Tree Protocol (MSTP). Root protection increases the efficiency of STP, RSTP, and MSTP by allowing network administrators to manually enforce the root bridge placement in the network.

This example describes how to configure root protection on an interface on an EX-series switch:

- Requirements on page 1
- Overview and Topology on page 1
- Configuration on page 3
- Verification on page 4

Requirements

This example uses the following hardware and software components:

- JUNOS Release 9.1 or later for EX-series switches
- Four EX-series switches in an RSTP topology

Before you configure the interface for root protection, be sure you have:

- RSTP operating on the switches.



NOTE: By default, RSTP is enabled on all EX-series switches.

Overview and Topology

Peer STP applications running on switch interfaces exchange a special type of frame called a bridge protocol data unit (BPDU). Switches communicate interface information using BPDUs to create a loop-free topology that ultimately determines the root bridge and which interfaces block or forward traffic in the spanning tree.

However, a root port elected through this process has the possibility of being wrongly elected. A user bridge application running on a PC can generate BPDUs, too, and interfere with root port election.

To prevent this from happening, enable root protection on interfaces that should not receive superior BPDUs from the root bridge and should not be elected as the root port. These interfaces are typically located on an administrative boundary and are designated ports.

When root protection is enabled on an interface:

- The interface is blocked from becoming the root port.
- Root protection is enabled for all STP instances on that interface.

- The interface is blocked only for instances for which it receives superior BPDUs. Otherwise, it participates in the spanning-tree topology.



CAUTION: An interface can be configured for either root protection or loop protection, but not for both.

Four EX-series switches are displayed in Figure 1 on page 2. In this example, they are configured for RSTP and create a loop-free topology. Interface `ge-0/0/7` on Switch 1 is a designated port on an administrative boundary. It connects to Switch 4. Switch 3 is the root bridge. Interface `ge-0/0/6` on Switch 1 is the root port.

This example shows how to configure root protection on interface `ge-0/0/7` to prevent it from transitioning to become the root port.

Figure 1: Network Topology for Root Protection

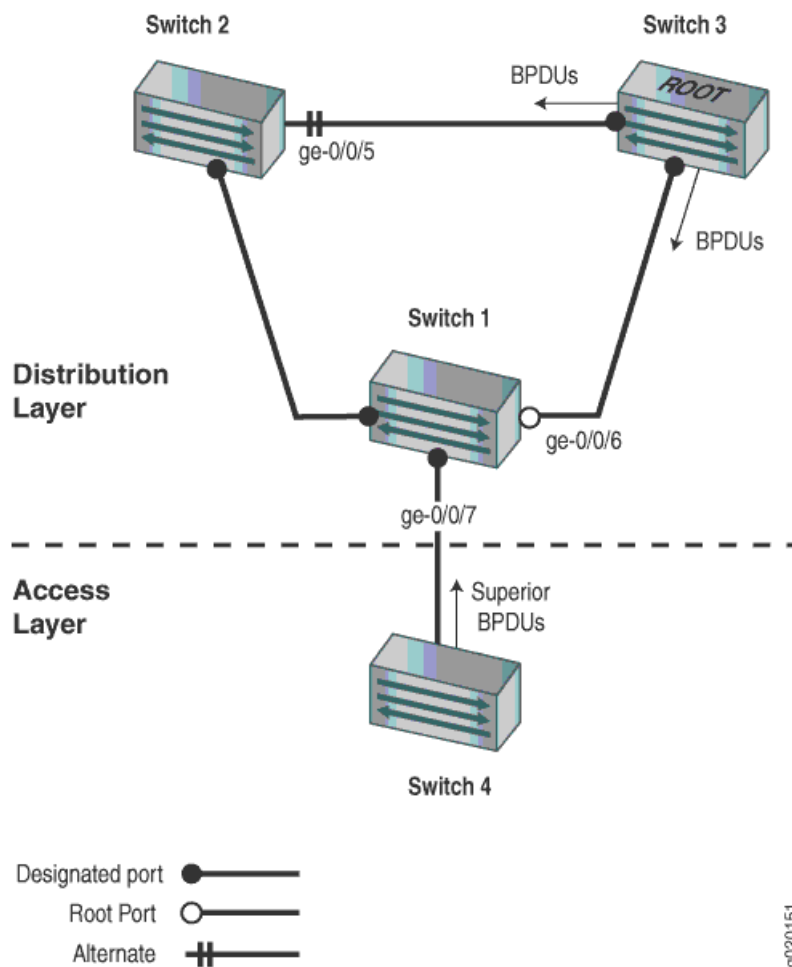


Table 1 on page 3 shows the components that will be configured for root protection.

Table 1: Components of the Topology for Configuring Root Protection on EX-series Switches

Property	Settings
Switch 1	Switch 1 is connected to Switch 4 through interface <code>ge-0/0/7</code> .
Switch 2	Switch 2 is connected to Switch 1 and Switch 3. Interface <code>ge-0/0/4</code> is the alternate port in the RSTP topology.
Switch 3	Switch 3 is the root bridge and is connected to Switch 1 and Switch 2.
Switch 4	Switch 4 is connected to Switch 1. After loop protection is configured on interface <code>ge-0/0/7</code> , Switch 4 will send superior BPDUs that will trigger loop protection on interface <code>ge-0/0/7</code> .

A spanning tree topology contains ports that have specific roles:

- The root port is responsible for forwarding data to the root bridge.
- The alternate port is a standby port for the root port. When a root port goes down, the alternate port becomes the active root port.
- The designated port forwards data to the downstream network segment or device.

This configuration example uses an RSTP topology. However, you also can configure root protection for STP or MSTP topologies at the `[edit protocols (mstp | stp)]` hierarchy level.

Configuration

To configure root protection on an interface:

CLI Quick Configuration To quickly configure root protection on interface `ge-0/0/7`, copy the following command and paste it into the switch terminal window:

```
[edit]  
set protocols rstp interface ge-0/0/7 no-root-port
```

Step-by-Step Procedure To configure root protection:

1. Configure interface `ge-0/0/7`:

```
[edit protocols rstp]  
  
user@switch#  
set interface ge-0/0/7 no-root-port
```

Results Check the results of the configuration:

```
user@switch> show configuration protocols rstp  
interface ge-0/0/7.0 {  
    no-root-port;  
}
```

Verification

To confirm that the configuration is working properly:

- Displaying the Interface State Before Root Protection Is Triggered on page 4
- Verifying That Root Protection Is Working on the Interface on page 4

Displaying the Interface State Before Root Protection Is Triggered

Purpose Before root protection is triggered on interface `ge-0/0/7`, confirm the interface state.

Action Use the operational mode command:

```
user@switch> show spanning-tree interface
```

Spanning tree interface parameters for instance 0

Interface	Port ID	Designated port ID	Designated bridge ID	Port Cost	State	Role
ge-0/0/0.0	128:513	128:513	32768.0019e2503f00	20000	BLK	DIS
ge-0/0/1.0	128:514	128:514	32768.0019e2503f00	20000	BLK	DIS
ge-0/0/2.0	128:515	128:515	32768.0019e2503f00	20000	BLK	DIS
ge-0/0/3.0	128:516	128:516	32768.0019e2503f00	20000	FWD	DESG
ge-0/0/4.0	128:517	128:517	32768.0019e2503f00	20000	FWD	DESG
ge-0/0/5.0	128:518	128:2	16384.00aabbcc0348	20000	BLK	ALT
ge-0/0/6.0	128:519	128:1	16384.00aabbcc0348	20000	FWD	ROOT
ge-0/0/7.0	128:520	128:520	32768.0019e2503f00	20000	FWD	DESG

[output truncated]

Meaning The output from the operational mode command `show spanning-tree interface` shows that `ge-0/0/7.0` is a designated port in a forwarding state.

Verifying That Root Protection Is Working on the Interface

Purpose A configuration change takes place on Switch 4. A smaller bridge priority on the Switch 4 causes it to send superior BPDUs to interface `ge-0/0/7`. Receipt of superior BPDUs on interface `ge-0/0/7` will trigger root protection. Verify that root protection is operating on interface `ge-0/0/7`.

Action Use the operational mode command:

```
user@switch> show spanning-tree interface
```

Spanning tree interface parameters for instance 0

Interface	Port ID	Designated port ID	Designated bridge ID	Port Cost	State	Role
ge-0/0/0.0	128:513	128:513	32768.0019e2503f00	20000	BLK	DIS
ge-0/0/1.0	128:514	128:514	32768.0019e2503f00	20000	BLK	DIS
ge-0/0/2.0	128:515	128:515	32768.0019e2503f00	20000	BLK	DIS
ge-0/0/3.0	128:516	128:516	32768.0019e2503f00	20000	FWD	DESG
ge-0/0/4.0	128:517	128:517	32768.0019e2503f00	20000	FWD	DESG
ge-0/0/5.0	128:518	128:2	16384.00aabbcc0348	20000	BLK	ALT
ge-0/0/6.0	128:519	128:1	16384.00aabbcc0348	20000	FWD	ROOT
ge-0/0/7.0	128:520	128:520	32768.0019e2503f00	20000	BLK	DIS

(Root-Incon)
[output truncated]

Meaning The operational mode command `show spanning-tree interface` shows that interface `ge-0/0/7.0` has transitioned to a loop inconsistent state. The loop inconsistent state makes the interface block and prevents the interface from becoming a candidate for the root port. When the root bridge no longer receives superior STP BPDUs from the interface, the interface will recover and transition back to a forwarding state. Recovery is automatic.

- Related Topics**
- Example: Configuring Faster Convergence and Improving Network Stability with RSTP on EX-series Switches
 - Example: Configuring Loop Protection to Prevent Interfaces from Transitioning from Blocking to Forwarding in a Spanning Tree on EX-series Switches
 - Example: Configuring BPDU Protection on STP Interfaces to Prevent STP Miscalculations on EX-series Switches
 - Example: Configuring BPDU Protection on non-STP Interfaces to Prevent STP Miscalculations on EX-series Switches
 - Understanding Root Protection for STP, RSTP, and MSTP on EX-series Switches

